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CEYLON'S ONLY INDIGO ESTATE.

A VISIT TO BARON SCHROTTKY'S AREA AT KALUTARA.

A GOOD CATCH CROP.

(*By our Special Representative.*)

There is doubtless considerable interest among planters in Ceylon in the Indigo crusade now being conducted in the Island by Baron Schrottky, a well-known Indigo planter and experimentalist. Baron Schrottky is conducting experiments at Kalutara, with a view to proving the statements he made at the Board of Agriculture meeting in March; and recently our representative had an opportunity of going over the estate and witnessing the process in its actual working phase.

The estate itself, Lagos, is situated some three or four miles from Kalutara station, and, it must be admitted, was not seen under the most propitious circumstances. Rain fell heavily the whole of the day. The journey from the station to the estate road was made in a gharry, and in many cases the road was axle deep in water. Heavy streams had gullied the road, and often had cut right across. The journey, incidentally, provided suggestive thought as to whether Ceylon roads are constructed on the most suitable basis. That, of course, is a matter not within the scope of the present article. The estate road was like most estate roads, and the hackery trip can be confidently recommended as a real liver-shaker.

A HEALTHY GROWTH.

The estate is in somewhat hilly country and the bungalow stands on the top of the main eminence. As one descended the last slope into the valley, one caught the first glimpse of the indigo growing area, and it was at once noticeable that the shrubs were of good growth and strength. The bungalow is surrounded by the plants, those about the house being mere dwarfs in comparison with those on the estate proper. For some time the rain made the verandah a more comfortable habitat. Hills in the distance were veiled in mist, and the country beyond the confines of the estate was nebulous in the wind-swept downpour. Naturally one took advantage of the opportunity of the occasion to get a better insight into the system of indigo planting, and Baron Schrottky gave details showing the wonderful improvements that had been effected in scientific treatment.

ARRECTA PLANT FOR CEYLON.

During a brief cessation a trip round the estate was made. There are something like sixty acres under cultivation chiefly of the new plant *Indigofera Arrecta*, a native of Natal. There was also a portion devoted to *Indigofera Sumatrana*, but even a cursory glance was sufficient to show which was the more useful variety. The Arrecta yields a larger crop, is a hardier plant, withstands prolonged drought better and does not need to be sown every year. It will crop for at least three years. Sumatrana, on the other hand, which is the original plant, attains to nothing like the size of the new variety, and at Lagos were like pot plants compared with the Arrecta. The latter grew to a height of quite six feet, and new cuttings three feet in length were frequently discernible.

PROLIFIC YIELDS HERE.

Ceylon, according to Baron Schrottky, is eminently suitable for the Natal plant, and our representative was assured that the land had in no way been prepared for the sowing. This was proved by the fact that on the harder ground the plant had not attained the same healthiness as on the softer and looser portions. According to Baron Schrottky four, five and six cuttings may be expected as against one in India, where owing to climatic conditions, the growing season is restricted to some

three or four months a year. The plant will grow anywhere where there is a suitable rainfall, about one hundred inches a year being ideal, and will thrive well up to four thousand feet. Prolific yields cannot be expected, however, in the more drier parts of the island. For Ceylon Arrecta is undoubtedly the plant, and the other varieties can be set on one side from all consideration.

The Factory Process.

The factory was, needless to say, most interesting, for it is in this connection that the success of indigo planting in Ceylon depends. Baron Schrottky's process is an entirely new one, and consists of four processes: 1 The Glucosode process, devised to get a better and more prolonged fermentation of the plant; 2. The second Steeping process, to enable a second dye-yielding steeping of the plant, which heretofore has been impossible; 3. The Alkali and acid process used in the last stage of manufacture to get a separation of the dye in the beating vat; and 4. The Fecula process to manipulate the indigo fecula, so as to convert it into a marketable standard paste of keeping qualities.

Apparently it is in the factory stage and in the cheapening success of this stage that the resuscitation of the industry depends. Synthetic dyes have usurped the position of natural indigo largely by their cheapness and facility of use. Scientific cultivation and manufacture is, therefore, essential to revivify the natural product which is far superior to the chemical product for its colour, its lasting qualities and its lack of injury to the fabric. To be successful, natural indigo, therefore, has to be cheap in order to compare favourably with the manufactured product, and in suitable form to compete with the synthetic dyes in ease of use. The old natural indigo was sold in the form of a dry dye, and expensive crushing apparatus had to be installed to reduce it to a usable fluid. The old type also had a great disadvantage in its lack of consistency of colour. There was a problem that would have to be solved to enable natural indigo to compete with synthetic on more equal terms. Manufacturers wanted the natural product after a few years' use of the chemical composition, which soon lost its colour, injured the article, and generally could not be compared with the old method. Competitive prices and its cumbrous methods militated against it. Without exaggeration Baron Schrottky appears to have solved the problem.

The New Method.

The factory is a simple structure. On the highest terrace are six teeping-tanks. On the next three beating vats, and below them the straining tanks, the water and chemical-tanks. On the lowest terrace are the two presses which bring the paste to its marketable form. The plant cuttings are brought to the steeping-tanks and laid down and covered with bamboo poles to keep out the air. Iron girders are used to control the pressure. Water is supplied to the cuttings by means of perforated tanks which supply an even flow and prevent the entry of air. For some hours the plants are then left to soak and ferment. Under the old process a second steeping of the plant was impossible as no method could be found for preventing air getting to the fermented plant. Baron Schrottky's scheme provides for a second steeping by an ingenious process. At the bottom of the tank is a perforated pipe which allows the fluid to be taken off gradually and evenly. By means of the perforated tanks, referred to above, fresh water can be put in without deleterious air reaching the plants. By means of the draining pipe, the fluid, which is of a golden colour, is taken off into the beating tank where it is treated by a kind of revolving fan and the constituents thoroughly separated. The superfluous water is then drawn off and the fecula left at the bottom. Meanwhile the second fermentation is at work. The fecula is then drawn off by means of pumps into the straining tanks where it lies until it becomes of the consistency of butter. Afterwards it is placed in numerous cloths and thoroughly pressed until it forms a paste which is subsequently packed in lead lined boxes and marketed.

A Test.

This, briefly, is the process. At the time of our representative's visit one of the tanks was being cleared of the plant which had been steeped twice, (and of this residue more later,) and a quantity of golden-coloured liquid was still in the tank, this being the third time that water had been put in it. Baron Schrottky remarked that there was still plenty of dye in even this third soaking, and a bucketful was secured for testing purposes. Some of the chemical liquid was poured into the bucket and the fluid vigorously stirred. The yellow colour gradually gave way to a dark blue, and indigo froth appeared, which, according to the Baron, is a sure sign of the presence of dye. A small quantity was poured into a saucer and revolved slowly. The Indigo fecula could then be plainly seen floating in the slight film of water at the bottom.

A Big Ceylon Average.

One of the presses was opened and the indigo paste exposed. It was of fine deep colour and

sound consistency. A small quantity was placed on a pencil and stirred in a cup of clear water. The water gradually took on a dark blue indigo colour such as is used in the dyeing process. Baron Schrottky speaks very optimistically of the chances of Indigo growing in Ceylon. In his opinion thirty-two thousand pounds of green plant should be secured per acre yielding 790 lb. of standard paste. This could be sold at two-thirds of the price of synthetic indigo. To the query, Would there be a market for the natural indigo, now that synthetic had secured such a hold?—the Baron said they would be only too ready to go back to it, if it could be secured at a reasonable price, and in a usual form, without expensive machinery. Letters supporting this were shown.

SEET AS MANURE.

The plant after its fermentation has a valuable use as a manure. It is called seet, and can be used immediately after fermentation; but if kept say six months, forms a brown mould which is a more handy form. This, in Baron Schrottky's opinion, is worth from 140 to 150 rupees per acre. Dr Cuntze, a well-known planter and experimentalist, is assisting Baron Schrottky in his experiments, and he appears exceedingly keen on the cultivation, especially as a catch crop. Supposing one plants rubber, he said, one can plant indigo also, and from the first year's crop of the latter plant can pay for one's land, factory etc. Succeeding years show a profit at a good rate. Meanwhile one's rubber trees are growing, and when they reach such a size that the indigo is affected, it can be cut out. With indigo as a catch crop one can therefore realise in the period during which the trees are coming into bearing. The indigo also provides the manure which is required, and the ideal estate in his opinion is that which holds a third of indigo. He himself is taking up its cultivation in the Kegalla district along with coconuts. "Is the rubber affected ?" asked the newspaper man. Dr. Cuntze pointed to some interplanted rubber trees on Lagos, of good size, etc., which, he said, were of one year's growth. They were certainly in good condition.

A GOOD CATCH CROP.

Other interesting information was furnished by Baron Schrottky illustrating the growth of the plant in Ceylon. Generally speaking, it appears to offer a useful catch crop, which will tide over the long period of waiting for other products to reach the bearing stage. Labour, of course, is a difficulty in regard to extensive cultivation of indigo by itself.

COCONUT PLANTING.

IN CEYLON AND MALAYA.

(Continued from page 461, May Number.)

In our May Number we published an article on "Coconut Planting" written by Mr. Manchip with a letter from our correspondent "B" Mr. Manchip replies in "Grenier's Rubber News" as follows:—

DEAR SIR.—When I wrote my modest article on coconut planting I had neither the thought nor the wish to be drawn into a newspaper controversy. My idea was to give a few hints to those intending to go in for land for themselves. "B" (who can be no other than Mr. Beven late of Horrakelle, Ceylon) says in his most superior manner, of course we know laterite soil is not suitable for coconuts. Yet the low country Cingalese (in whom Mr. Beven seems to place so much confidence) have planted up hundreds of acres of laterite. His remark in para 3 re out-turn on estates with a free soil tend to bear out my statement that a free soil is better than a stiff one. I was referring to the estate of which Mr. Beven was Superintendent when I spoke of "loose white sand." But here again he agrees with me (though perhaps not intending to) that this class of soil is unsuitable for coconuts unless systematically fertilized; for he says "when I took up the management the white sand fields were allowed to *go out of cultivation.* I reclaimed these fields" and evidently got good results. Now it is a fact that manuring was stopped on these fields after Mr. Beven took charge—I do not say on his advice—and the crops fell off very considerably and it was not until a regular system of manuring was adopted that things brightened up once more. I venture to think Mr. Beven exaggerates when he says the Straits (I presume he includes the F. M. S.) are plagued with black beetle. So far I have seen very few trees even here damaged by beetle. In Ceylon, well Mr. Beven knows, without my telling him, of the damage done by these pests, black or otherwise. What a good old Conservative Mr Beven must be when he prefers to stick to methods "handed down to us by the Dutch." Why does he not rather favour his Cingalese friends' method of crowding in as many coconut trees as possible to the acre. Not so far back as the Dutch times we were told 10ft. by 10ft. was the proper distance to plant rubber; but we have other ideas today. Re size of holes, I said these should be dug *at least* 2½ft. cube. Personally I would prefer them as large as possible but the larger the hole the more the cost. Mr Beven misquoted me badly

about picking of nuts. He should read my para again. I said I knew of no other country where men climb the trees and pick the nuts. This does not infer that in Ceylon no other method of collecting the crop is favoured. His remark about the lie is not in the best of taste. Perhaps *he* would have 4,600. But, Sir, I find my figures were wrong after all. We had 75 trees to the acre and in 1896 the pickings turned out an average of 63½ nuts per tree over the whole of the bearing portion. This gives 4,752½ nuts per acre on the average. What does Mr Beven think of that? He perhaps would have said 4,750 or 4,755, or something else *not correct.* I have always been under the impression that there were 4 and not 5 candies to a ton.

In conclusion Mr Beven should travel and see what other countries can do in the way of coconut producing. I, also, at one time thought it impossible to beat Ceylon as a coconut country. But travel has changed my views.—Yours,

T. A. MANCHIP.

"B's" FINAL REPLY.

Negombo, 5th June, 1912.

DEAR SIR,—My friend Mr. Chas. Grenier, Editor of "Grenier's Rubber News," sends me his issue of the 29th May, presumably because it contains a (very angry) reply of Mr. Manchip to my letter of the 28th April last, which was written in response to a request from you for opinions on Mr. Manchip's letter. It will be well for Mr. Manchip to learn that a discussion can take place without a childish display of temper. My "most superior manner" must be evident only to Mr. Manchip's distorted vision. Europeans, as well as natives, have "planted up hundreds of acres of laterite" I cannot divine what Mr. Manchip is aiming at when he writes "the low-country Sinhalese in whom Mr. Beven seems to place so much confidence." I always place confidence in anyone, whatever his nationality, who deserves my confidence. The veriest tyro knows that "loose white sand" will not yield good results as regards cropping unless fertilised.

What Mr Manchip states as a fact "that manuring was stopped on these fields (loose white sand) after Mr Beven took charge.—I do not say on his advice—and the crops fell off very considerably, and it was not until a regular system manuring was again adopted that things brightened up once more," is pure, unadulterated fiction, evoked out of a very imaginative brain. I know nothing personally of the Straits. I have read that black beetle has proved to be a pest, and has been legislated against and that there is an Inspector of Pests. In which part of the Straits, I do not know. I favour the Dutch distances of putting down coconut plants 25' × 25' as I think that a proper distance. This is the almost general distance adopted by all coconut planters. There was no occasion for Mr Manchip to indulge in the cheap and ill-mannered sneer of my "Sinhalese friends' methods." Anybody but Mr Manchip would have seen that my reference to his great care to be exact was banter. Is Mr Manchip a Scotchman?

I am very interested to learn that Mr Manchip picked 63½ nuts per tree in 1896 "over the whole bearing portion." The information would have been more interesting if Mr Manchip had mentioned its acreage. I made a slip in my previous letter when I calculated the ton at 5 candies. "J. D. V." of Negombo corrected me and I thankfully received his correction. I am most anxious, and had been before Mr Manchip advised me, to travel and enlarge my experience of coconuts. I applied for leave to my previous employers at the beginning of last year to go to the Straits. The reply was: "Your application cannot be entertained." If I had the time and the means, I would visit not only the Straits, but Java and Sumatra as well. I do not hold the opinion with which Mr Manchip credits me, that it is "impossible to beat Ceylon as a coconut country." I wish, by personal inspection, to satisfy myself that other countries do better than we. This ends this controversy, in which we are both agreed in the main.—Truly yours,

B.

COCONUT BUTTER: OLEOLINE.

Captain Svensen, of Brisbane, who has large interests in the Solomon Islands, told a Sydney interviewer that copra, the flesh of the coconut was steadily advancing in price, and was today three times as high as it was when he started planting in the islands twenty years ago. One reason for this was that a variety of butter, known as oleoline, was being manufactured on the Continent out of coconut oil. The product was pure white, with a rather nutty flavour, and many people preferred it to the ordinary butter. In Germany, where margarine was prohibited, a tremendous demand had set in for oleoline. It sold there at from 3d to 4d per lb. less than best butter. He was surprised that some manufacturer had not started operations in Sydney, where the copra could be got cheaper A lot of oleoline, perhaps not under that particular name, was imported into Australia, and used for confectionery purposes. He had been informed that the Hindus, who on account of religious scruples would not touch butter made from cows' milk, were beginning to use the coconut butter; and if this were the case, it would give an enormous impetus to the coconut growing industry.—*Fiji Times.*

A STEAM COPRA DRIER.

The "Philippine Agricultural Review" for April describes a Steam Copra Drier which will be of much interest to coconut-growers everywhere. The result of the experiments to be made with it should be of great value to all coconut estate managers, who must erelong be widely taking up modern methods of culture and cure, if they are to economise and get the best possible returns in nuts and in profits on all the produce as prepared for the market.

A STEAM COPRA DRIER,

OF THE PHILIPPINES BUREAU OF AGRICULTURE

(By H. T. EDWARDS, *Assistant to the Director of Agriculture.*)

With a loss of several million pesos annually, by reason of the crude and unsatisfactory methods used for drying copra in these Islands, the introduction and use of an improved copra drier becomes a question of great economic importance. The original plans for an apparatus to use steam heat were furnished about one year ago by Mr. O W Barrett, chief of the division of experiment stations, but the details of construction have been worked out by Mr Z K Miller, machinery expert of the Bureau. Unfortunately Mr Miller did not have time to make any preliminary tests of the drier at the Pandacan repair shops of the Bureau, but it was decided to exhibit the original apparatus at the Exposition and to try it out there on the grounds instead of delaying its introduction to the public any longer. It is believed to be the first machine of this type. When perfected it may meet the requirements of the Philippine copra industry and thus help to raise the standard of that product in the Orient.

This drier is 5·64 meters long by 91 centimeters wide, 3 meters high at the front and 2·44 meters high at the rear end. Its sides are constructed of angle iron frames for the sections into which are riveted two sheets of plain galvanised iron with 3-millimeter asbestos millboard between. The tracks for the trays are set on an incline of 61 centimeters to 46 centimeters. There are three rows of those trays with a 51-centimeter space between the rows. Each row holds four trays or a total of twelve trays for the drier. The trays, which are 91 centimeters by 1·37 meters, and 1 decimeter deep, are constructed of wire and angle iron with the bottoms made of bamboo slats set 6 millimeters apart. Each tray has a capacity of about 160 nuts. The trays are fitted with trunk rollers and can be easily handled by two labourers. The incline is such that very little effort is required to push the trays when loaded. Each track has an entrance door and a discharge door 91 by 28 centimeters. There are also three doors of the same dimensions on the top of the drier to carry off the moisture while fresh air is admitted at the bottom below the coils. The coils, located at the bottom of the drier, contain 1,219·20 square meters of heating surface, which will maintain an even temperature between 15° and 180° and will dry the copra in fifteen hours.

There are three methods of handling the raw material in connection with this type of drying apparatus:

1. The Birchfield method which cultivates the necessity of husking the nuts—that is, the entire nut is chopped in halves by means of a heavy broadaxe, the halves being immediately placed either in the sun on a concrete or hard earth *patio*, or placed directly in the trays of the drier where after two or three hours the meat may be readily removed and then replaced to complete the drying process, the refuse husk and shell being thrown aside for fuel.

2. The husked nuts are broken in halves and the shells are either set out to dry in the sun so that the meat can be removed after about one day of good weather, or else put directly into the trays of the drier and treated as by the first method.

3. The meat from whatever process at any stage of dryness is put into the trays without considering the previous operations and kept there until the attendant in charge pronounces the drying complete. With the latter method of procedure the capacity of a drier of this size is estimated to be about 3,000 nuts in twenty-four hours.

It must be remembered that unripe or partially decayed nuts cannot be expected to make first-class white copra, though there is a better chance of obtaining a fair article by the use of this type of drier than by the prevalent "tapáhan" method; the faults which are partially concealed by the tapáhan method—that is by the smoke obscuring the natural colour of the material—are brought out clearly in operating artificial driers. Pinkish or brownish pieces of copra can be readily traced to either one or the other of the errors which are so deplorably common in Philippine copra making; that is, *unripe* or *overripe* kernels.

The principal advantage in the use of the steam drier is that it is practically impossible to burn the material during the drying though of course, the time required for turning out a copra

which will endure storage in the bodega for several months is considerably longer in the case of an apparatus like this than with a hot-air, or rotary oven type—makers of some machines of the latter type claiming to be able to turn out thoroughly dried copra in "two to three hours."

Either husks, shells (or in the case of the Birchfield method, the two materials attached), wood, or coal, can be used for fuel. Only the simplest type of boiler is required for furnishing steam; of course, a comparatively large grate is necessary if the husks are used; and in case the shells alone are burned, care must be taken to protect the sides of the furnace from the intense heat by means of sheet iron or similar material. The water condensing from the pipes in the drier returns, of course, to a tank or reservoir from which water is injected back into the boiler as often as required. Thus there is practically no expense for either fuel or water in operating a drier of this type.

The present drier cost about p600. A drier constructed along similar lines with reinforced concrete walls, boiler, and accessories complete having a capacity of about 15,000 nuts per twenty-four hours, can be constructed for approximately p2,500.

The drier exhibited at the Exposition grounds was set up there before it had been tested or even assembled at the factory. Considering this fact the results obtained were exceptionally good. A number of prominent copra dealers and owners of coconut plantations examined the drier in operation and were enthusiastic over the quality of the finished product. Several of these people wanted to buy the drier, stating that they were well satisfied with the results.

This drier will be taken to the Pandacan repair shops of the Bureau of Agriculture where exhaustive tests and experiments with it will be carried on for several months until accurate information has been obtained as to the most economical method of drying copra. The information thus obtained will then be published.

PROTECTION OF COCONUT PALMS FROM BEETLES.

In the Philippines.

Act No. 286 of the Legislative Council of Moro Province, passed April 29th, 1912, is printed herewith and, though a drastic measure, provides the only apparent remedy for the beetle scourge which has already created great havoc in the coconut groves of this Province. This act as proposed was given publicity several weeks ago, and discussion of the measure was invited. As every tree infected by beetles is doomed to death and is also a nucleus of infection for all surrounding trees, the sooner radical measures are adopted for the destruction of infected trees and the discontinuance of breeding places, the better for the welfare of the entire coconut industry.

We anticipate that there will be much dissatisfaction with the enforcement of this law by those who already have infected trees; but as the safety of remaining, sound trees, as well as future plantings, depends upon prompt and radical measures, it is to be hoped that there may be co-operation of all coconut owners in saving this most important industry.

Act No. 286.

Section 1.—It shall be the duty of the owner or person in charge of any coconut tree which is dead or attacked by the rhynchophorus ferrugineus, commonly known as the red beetle, to immediately uproot such tree and either to burn the same or to bury it in the ground at a depth not less than one meter or completely submerge it in water so that said tree may not serve as a breeding place for beetles and that the beetle and eggs and larvæ thereof which may be contained in said tree shall be totally destroyed.

Section 2.—Any owner or person in charge of coconut trees who shall neglect or refuse to perform the duty imposed upon him by the next preceding section shall be liable to a fine not exceeding fifty pesos for every tree in respect to which such neglect or refusal occurs.

Sec. 3.—It shall be unlawful for any person to keep or permit to remain on premises owned or occupied by him dead coconut trees or stumps, coconut timber or rubbish heaps, vegetable refuse, or other matter likely to harbor or become breeding-places for the oryctes rhinoceros, commonly known as the black beetle, or the rhynchophorus ferrugineus, commonly known as the red beetle, and any such person who shall neglect or refuse to remove or destroy the same when requested so to do in writing by any officer of the district or municipality wherein said premises are located, or by any owner or occupant of land planted with coconut trees and situated within one mile of the premises on which such dead coconut trees or stumps, coconut timber or rubbish heaps, vegetable refuse, or other matter are kept, shall be liable to a fine not exceeding two hundred pesos.

Sec. 4.—Upon the conviction of any person under sections two or three hereof the governor

of the district wherein such premises are located shall cause such dead coconut trees or stumps, coconut, timber or rubbish heaps, vegetable refuse, or other such matter to be removed or destroyed, and the costs necessary therefor shall be a lien upon the property and collectable as are other taxes upon real property.

Sec. 5.—All provincial, district or municipal officers shall have access at all reasonable times into and upon any land whereon any coconut tree is growing for the purpose of inspecting such tree and also into and upon any land or premises where there is reason to suppose that there are kept any such things as in article three hereof are referred to.—*Mindanao Herald.*

LEAF MANURE.

The question of the provision of leaf manure has been engaging the attention of the Madras Board of Revenue and the District officers during the last two years, and in May last year the Government passed orders on the recommendations of a Committee appointed to consider and report on the question of the supply of green leaf manure by the Forest Department. It was then laid down that its functions were mainly limited to the production and supply of seed of green manure plants, and the Agricultural Department was instructed to arrange for the supply of seed of the different green manuring crops in quantities sufficient to supply the demand at the lowest price compatible with the avoidance of loss. At the same time the Government directed that the seigniorage on green leaf manure should be raised so as to approximate to its real market value. The latter order was sooner carried out than that for the distribution of seed for raising green manuring crops ; in many districts ryots have had to suffer much from what has apparently been felt as a measure of hardship, viz., the sudden raising of the price of forest leaf "to a figure which might prove to be prohibitive." The Board of Revenue has accordingly reduced the scale of prices by about 50 per cent in some districts such as South Arcot, Nellore, Chittore and Ramnad, and even lower in the case of others. These revised rates, however, will hold good for a year, subject to report on the effect they have produced upon removals and the extent to which other forms of green manure or seed for raising green manure crops are available in each district. The object of the Government is to put an end to the practice of the ryots relying upon forest leaf, and to induce them to resort to raising green manure crops on their own land. There is much to commend in the policy of raising one's own green manure on one's own land and ploughing it into the soil ; but the ryot who is intelligent enough to appreciate the value of green manure is not often sufficiently educated to realise the eventual economy of raising it on his own field. A wrong impression prevails among the ryots, that land sown with a green manure crop is as liable to be assessed as land growing an ordinary crop ; and any misapprehension that may exist on this head must be removed before the movement can become thoroughly established among ryots.

GROWTH OF CAMPHOR PRODUCTION.

ARTIFICIAL GOODS PROVE TOO COSTLY FOR RIVALRY WITH NATURE.

The camphor production of this country last year was 2,000,000 kin, a record figure for many years past. Of the total, 650,000 kin were exported, 950,000 kin taken by home refineries, 350,000 kin used for the manufacture of celluloid, and the rest consumed for various other purposes.

The artificial camphor disappeared from the market last year, owing to unremunerative cost of its manufacture. On the other hand the demand for natural camphor increased as the result of the diminution of the supply from Fukien province, China, owing to the revolution. It is impossible to increase the domestic production without risking the destruction of the forests.

The demand in the home market is on the increase year after year. Last year 600,000 kin were consumed for the manufacture of celluloid, which promises to increase in future along with the advance of the industry. The demand for other purposes is likewise increasing and, considering that the production cannot be further augmented for the reason stated, the quantity of crude camphor available for export will be necessarily reduced. The plan to raise the price by the Monopoly Bureau is thought impracticable, because in that case China could supply the foreign markets with its production, and the higher price would encourage the manufacture of synthetic or artificial camphor. If the demand for the artificial product should continue to increase, it would result in the invention of less expensive methods, which would be likely to injure the interests of the State monopoly. The authorities are investigating the matter, which is of grave concern.—*Japan Times*, May 11.

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CANNING MANGOES.

NEW INDIAN INDUSTRY.

Mr W H Michael, United States Consul-General, Calcutta, writes in a recent report:—

A few years ago a young Hindu named A B Sircar conceived the idea of canning mangoes in India. After giving the matter considerable thought he went to the United States to learn the art of canning peaches and other fruits grown in California, and also the trade of tinner or at least enough of the trade to be able to manufacture tin cans and to solder the cans in the best manner when filled with fruit. He spent several years in different canneries in California and also obtained degrees in chemistry and bacteriology. He returned to Calcutta and secured sufficient financial backing to

ESTABLISH A PLANT AT MUZAFFARPUR,

which is about 350 miles from Calcutta on the East Indian Railway. About Rs75,000 has been expended on the plant and all the machinery was purchased in the United States. Although just starting in the business, 20,000 cans of mangoes and pineapples were shipped to Europe in 1910, mostly to London, in 1911 shipments aggregated 18,000 cans of mangoes and 12,000 cans of lichis to Europe. At the branch here a case of 24 2½-pound cans sells for Rs42, and it costs Rs10 freight to land a case in London. The company also sells lichis put up in 1½-pound tins.

THE PROCESS

of canning the mango is precisely the same as that employed in canning freestone peaches in California. The mangoes are carefully pared and the stones taken out. Overripe, bruised or otherwise unfit fruits are rejected. The mangoes thus stripped of their peel and stones are put in cans, which are then weighed and filled with syrup. Then the cap is soldered on to the opening of the can with a capping steel, leaving a vent hole in the middle of the can for driving out the air inside. Steam from a boiler is passed into water in a large wooden vat and the cans are placed in the boiling water in crates suspended from a crane. This is called exhausting. After the air has been driven out the vent hole is soldered up and the cans are put in boiling water. This operation is called processing. After a certain time the cans are taken out and placed in the cooling vat. Some of the cans are put in an incubator and the fruit examined with a microscope to see whether it is free from bacteria. Last year the canning plant employed more than 80 persons per day. The common labourers receive 5 to 8 annas a day, and those who peel the fruits are paid by the hundred. It is said that the employees show wonderful adaptability to the work, and at the end of the season were able to do three times as much work as at the beginning. Even persons belonging to high-caste families took an interest, and some of them became employees in the cannery. It is believed that plenty of intelligent labour can be obtained.—*Times of India*, June 4.

THE AVOCADO PEAR.

The Avocado (sometimes corrupted into "Alligator") Pear is the fruit of the tree known to Botanists as the *Persea gratissima Gaertner*—a tropical American Lauraceous species which, together with about twenty-five others, makes up the genus of evergreen trees that flourishes from the cool and balmy sea-coast to the hot and arid regions of the interior. The centre of the natural distribution of the species is the south of Mexico and the east of Peru, where it is a denizen of the dense evergreen forests that instal themselves on the banks of streams. The range of its growth, in a south-easterly direction, is limited by the Amazon and its tributaries in Brazil. The centre of its economic cultivation is Porto Rico. It has beon introduced into Florida, California, Jamaica and the West Indies generally, and is widely distributed in the colonies of the old world. The Sunda Islands, Mauritius, Madagascar, Bourbon, Ceylon, Hawaii, Malaya, Queensland, Natal, the Azores, and the Canaries are, at present, among the regions of its cultivation. In its natural home, the Avocado attains its greatest perfection in localities that are sheltered in the valleys of the Coast Ranges between altitudes of 2,000 and 3,000 feet. In Ceylon it is vigorous between 1,000 and 2,000 feet, but "fruits well also at lower elevations if the rainfall is not below 60 inches." In India, "it thrives up to an elevation of 4,500 feet" above sea-level. This very wide range of distribution of the species is an index of its great powers of adaptability to a variety of soils and climates in both the tropics and sub-tropics of the world. The Avocado is a small to medium size tree, which attains to heights of 20 to 40 feet. It is of a bushy habit of growth, with elliptical to lanceolate glossy-green leaves that are simple, acute, narrowed near the base, long-petioled, and about six inches in length. The flowers are green, which the pear-shaped fruit, which is pale-green, yellow, brown, or purple, is sometimes tinged or streaked with red. It is from 4 to 6 inches long and 3 to 4 or 5 inches across at its thickest part, which is near the free end. It is borne at the tip of a thickened stalk, which terminates the slender twig that springs from the top or side of a straggling branch. The edible part of the fruit consists of an aromatic mass of buttery pulp that lies between the skin and the seed, and is divisible, at maturity, down its length, into two equal parts, from apex to base. The single seed is large and fleshy. It is round or slightly pointed at the base. Two classes of the fruit are usually met with the one, of Mexican origin, having a smooth thin skin, is small and green and often tinged with red or purple; while, the other, of Guatemalan descent, has a thick rough skin and varies much in colour, size, shape, and flavour. The trees bearing the two kinds of fruits are said to also present variation in regard to leaf and habit of growth; the Guatemalan type being distinguished by more lanceolate leaf and a more open habit than the Mexican, which, in its turn, is hardier. The disadvantage attaching to the thin-skinned fruits is that they are easily bruised and injured in handling, packing, and transport. The seed, too, at maturity, becomes detached from its supporting membranes and, by rattling up against the walls of the pocket in the pulp in which it is placed, tends to injure the fruit when shaken. These features have hitherto stood in the way of the transport of the fruit on a large, commercial, or extensive scale; and, consequently, the thin-skinned Mexican Avocado, though grown in many localities in the world, is still unknown in most of the countries lying outside the bounds of its cultivation. These circumstances, coupled with the fact that the seed soon loses its power to sprout, account for the scarcity of the fruit in countries removed from the field of its growth. These disadvantages do not attach, to the same extent, to the Guatemalan Avocado; for its tougher skin admits of its being handled with greater freedom and less fear of injury; consequently, endeavours are being made in places, where the fruit is to be grown in quantity, to raise hybrids between the two varieties and to graft or bud the Gautemalan upon stocks of the Mexican Avocado. The tree is easily raised from seed, but is seldom "true" to the type sown. Seedling trees, though hardier than grafts, also take longer to go into fruit, bearing, in most places, only from 16 to 25 years after sowing. Budded trees, on the other hand, may be induced, it is said, to fruit in the third year from being set out. Budding has the further advantage of tending to dwarf the trees to some extent; so that, an orchard of any given extent would hold more grafts than seedling trees. The budding (Shield Budding), planting, irrigation, and treatment of the Avocado tree may be made to follow tho same general principles of culture as are adopted in the cultivation of the larger Citrous fruits. But the special facts to be borne in mind in the cultivation of the Avocado are that for young stocks buds from young wood should be used; that irriga-

tion should be free and copious; that the soil should be well drained, deep, and friable; and that the species is partial to localities in which alterations of wet and dry seasons prevail. As regards the selection of varieties for cultivation, much success has already attended those known in America as "Trapp" and "Pollock"; and these are likely to also give the best results, for the present, in India; but, generally, it may be said on the subject, that the most desirable objects to be secured in the cultivation of the Avocado in new localities are the production of fruits which shall combine the following qualities among the rest:—(1) prolificness, (2) a thick and leathery skin, (3) good keeping qualities, (4) small seeds which completely fill the pocket in the fruit and do not rattle, to its detriment, when shaken.

The dietetic value of a fruit depends upon its acid juiciness and flavour. The juicier a fruit, the greater is its value, particularly as an article of food; actual chemical analyses of the best fruits always revealing the presence in them of, proportionately, large quantities of water; and as the majority of the finest of edible fruits are either acid or sub-acid, their acid juiciness is, in fact, the property for which they are chiefly prized. This acid juiciness is dependent upon the presence, in more or less quantity, of sugars and certain organic acids familiarly known as the free fruity acids. Of this latter class, Citric and Malic acids are said to be highly antiseptic bodies which tend to prevent the germs of disease from finding a place or developing in the body. The flavour of a fruit is due, in part, to the presence in it of the organic acids, but is more largely the result of the occurrence in the pulp of certain volatile oils and aromatic substances (ethers). These three classes of bodies tend to lower the temperature of the blood and to keep the whole digestive tract, together with all the organs of secretion, in a working and thoroughly sanitary condition. Judged in the presence of these criteria, the remarkable fruit called the Avocado Pear is possessed of great dietetic value; for, though it is not, and never will be, a dessert fruit, like the apple or grape, its wholesome properties and attractive flavour have already helped to make it one of the most highly-prized and justly coveted salad fruits of the tropical world. The proportion of fat which the pulp contains has been estimated at from 8 to 18 per cent., and it is to the presence of this estimable property that the fruit owes much of its value as a staple food and its great and increasing popularity in all the countries of its cultivation. Again, three of its most familiar names—"butter fruit," "poor man's butter" "soldier's butter"—are due to the fact that, in the countries of its production, it is used by the natives in lieu of butter fat. The fat is a green aromatic oil with the odour of laurel oil and a peculiar attractive flavour; it solidifies at a temperature of 15 degrees centigrade. It is one of the most delicate of West Indian fruits, being known there as "vegetable marrow," and, from its chemical composition, as determined by Patrault, it will be seen that its claims to recognition as a food-stuff are not based upon mere fancy or caprice, but upon an almost ideal proportion of the elements which tend to make any fruit with them valuable. These are:—

Water	... ...	82.1 per cent.
Protein	... ...	1.2 ,,
Fat	... ...	8.7 ,,
Sugar	... ...	2.9 ,,
Cellulose and undetermined material	... ...	4.6 ,,
Ash	... ...	0.5 ,,

This pulp is so rich and mild that the addition of a spice or other substance is necessary to give it the requisite piquancy. Accordingly, Port wine, sugar, lime-juice, pepper and salt, vinegar, Worcester sauce are among the adjuncts which help to make the pulp the delectable article of diet which it is. It is also used as an ingredient of other salads, and frequently becomes a favourite even with those who do not like it at first. But the fact remains to be noted, in spite of the glories that have been sung of the fruit, that until varieties combining the qualities which have been already noted as desirable in the Avocados which we would cultivate commercially for profit can be evolved by budding and grafting, its value as a marketable commodity will be doubtful. At present, and for some time to come, the Avocado is likely to remain among that select class of fruits which, in the quiet leisure of our respite time, we would raise for our own and our children's use in a corner of the garden around our homes. And if it be true that the value of a product which a man grows for his own and his family's benefit is always to him more precious than the riches which he would cull by the sale of what he grows for the world, then it seems to me to be also true that budded stocks of the better varieties of this remarkable salad fruit of the West are worthy a place in the garden in which, forgetting the cares and the worries of work and life, he would raise the products he will not sell.

A. M. S.

—*Capital*, May 2.

SALES OF PRODUCE IN BRITISH AND CONTINENTAL MARKETS.

Fibres, Cotton, Grain, Oil Seeds, Hides and Skins, Timber, Rubber, Drugs, Wool, Ores, Mica, Gums, Tea, Cocoa, Coffee, Copra, Sugar, etc., are being regularly dealt in; Keymer, Son & Co., being selling Agents for Estates, Mills and Exporters.

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MR. WICKHAM'S NEW TAPPING KNIFE.

We had an opportunity recently of seeing the very strong and substantial tapping knife which Mr H A Wickham—the Father of the Rubber Industry in the East—has invented, brought out by Messrs, David Bridge & Co., for whom the Colombo Commercial Co. are the Agents in Ceylon. Those rubber planters who visited this Company's attractive Pavilion at the Ceylon show would have examined it. It consists of a very powerful spring handle, attached to which are three chisel-like knives of nearly an inch in width almost totally enclosed in a metal box, but each of which comes through an aperture and performs its instantaneous task when a quick blow is given to the spring handle. The knife, of course, has to be placed perpendicularly against the tree bark,the individual chisels making parallel incisions at an angle of 45 degrees to the upright. The depth of the cut can be easily regulated, and from the general build of the knife we imagine that the coolie would be less able to go wrong with this instrument than with almost any other. Mr Wickham was not able to explain to us scientifically the reason why there were three individual knives instead of one; but from the fact that it is, in principle, on the South American Indians' mode of tapping, which is the most skilful in the world, no doubt it will produce the best results, in yield and minimum injury to the tree. Mr Wickham is convinced that the method of paring away the bark, and making large incisions, is bound to be detrimental to vigor and further yield; many estates today confirm his view. Incidentally, we might mention that Mr Wickham, who all along has been an enemy of close planting,—in fact an advocate of one hundred trees to the acre or rather less,—is finding his views supported by the way in which many Ceylon rubber plantations where there are 220 trees to the acre, more or less, show trees of entirely deficient proportions and with no prospect growing as *Hevea* should—and does in the Brazil forests. The growth (in girth especially) is delayed and malformation of the trees militates against their giving early or pormanently abundant yields. Mr Wickham proceeds very shortly to Peradeniya and some upcountry estates. We shall be interested to hear his views, and the changes he has noted, on his return.

PAPAYA AS A DIGESTIVE.

How many people know that the papaya fruit, which is in full swing just now in our fruit markets on this side of India, is one of the very best cures for that distressing complaint known as indigestion or dyspepsia? Analysis shows that this fruit is extremely rich in peptonic qualities, so rich, in fact, that a piece of the toughest meat placed between two slices of the fruit will not only become tender but somewhat predigested. The papaya tree is one that should be found in every garden. It produces fruit in from nine months to a year from the time the seed is sown, and, according to the best medical evidence, a sound papaya would make a valuable adjunct to the breakfast table of each and all of us. But dyspeptics should take special note,

JAVA CINCHONA AND QUININE.

Mr David Hooper, Reporter on Economic Products to the Government of India, has rearranged, after translation, van Gorkom's pamphlet on Cinchona in Java from 1872 to 1907, so that it may be of greater utility to cinchona planters in India. This pamphlet is supplemental to van Gorkom's "Handbook," translated by Mr B D Jackson, and published in 1883, and also to Moens' treatise "De Kinacultuur in Azie," 1854-1882. Since these appeared, no books in English describing the remarkable progress made in Java cinchona cultivation have been published, and van Gorkom's latest pamphlet is thus the nearest thing to date, Although it contains nothing really new, the translation is most appropriate at the present juncture, when so much expectation has been aroused by negotiations between European quinine interests and Java planters with a view to working more to mutual advantage. Van Gorkom's original pamphlet dealt with matters chronologically, which had its demerits; Hooper has arranged the information in narrative form. The idea of cultivating cinchona in the island is reckoned to have taken shape in 1854, but not until several years later did those chemical researches begin which have marched so steadily with the development of the plantations. It was, in fact, only in 1870 that cinchona culture in Java had become so advanced as to supply material with success for the commencement of systematic chemical research. A chemist was appointed in 1872. Interesting is it to recall

THE STEPS TAKEN BY EUROPEAN NATIONS TO FORTIFY THEMSELVES IN THE SUPPLY OF QUININE

against the failure of the South American forests First, the French through La Condamine in French Guiana and through Weddell in Algeria —but both failed. Then the Dutch Government in 1852 sent Hasskarl to South America and he was brought to Batavia on a Dutch warship with a precious cargo of 21 cases of young plants. The British Government in 1858 sent Markham to Bolivia and South Peru, and he had to get his living plants down to the coast by stratagem. Spruce, Cross and Pritchett made supplemental expeditions. In 1865 an Englishman, C. Ledger, obtained from an Indian a packet of particularly valuable seed, a part of which was sold privately to British India and part to the Dutch Government, its value being altogether unsuspected by the sellers. Meanwhile, from 1865 the Dutch Consul-General at La Paz contrived to forward seeds to Holland, and in 1868 the Consul-General at Caracas also assisted to this end. In 1872, when the history of Java cultivation practically begins, there were in the island stocks of *Cinchona calisaya* (from Weddell's seed) and of *C. Ledgeriana* (from Ledger's seed), beside stocks of *C. calisaya* from Hasskarl's mission and from the Consular efforts, stocks of *C. officinalis* raised in Java from seed sent from Madras and Bengal, a supply of *C. succirubra* received from Bengal, Madras, and

CEYLON, AND OTHER STOCK,

aggregating 1,009,000 plants of *C calisaya*, 164,000 of *C. succirubra*, 188,000 of *C. officinalis*, 16,000 of *C. lancifolia*, and 1,050 of *C. micrantha*. At the end of May, 1872, Moens was able to start his analytical investigations at Bandoeng, and his first duty was to find the relative values of the different species, *C. Ledgeriana* being proved superior and the alkaloidal values of the other varieties were in due course determined; also the status of the alkaloids in the bark at various stages, and the most productive methods of propagation and cultivation. The effect of grafting, the influence of seasons, manuring, in fact all matters appropriate to placing the industry on a thoroughly established basis, were undertaken and are in specialised forms still proceeding, with the result that Java has got the world's supply of bark in her hands.

Question has been raised with some emphasis lately as to

WHETHER JAVA CANNOT SUPPLY ALSO THE QUININE THE WORLD REQUIRES,

instead of leaving this function to European and American manufacturers. There is, of course, a factory at Bandoeng, and there is talk of establishing another in the island, whilst some of the planters have great hopes of making quinine themselves from the green bark by Van Leersum's new process. Great difficulties would have to be overcome, not the least of which would be the natural preference of consumers for the product resulting from the specialised apparatus, processes and experience of Western makers to that from the manufacturing experimentalists in Java. It might be that their production would never be above the crude stage; in this connection it is interesting to recall some of the outstanding efforts at manufacture by the Dutch. Eydman, a pupil of de Vrij, in 1874 converted *succirubra* bark into coarse mixed alkaloids called "quinetum," which is described as a good-looking preparation of sufficient purity, which was a good febrifuge, and could replace sulphate of quinine in many cases. Its variable composition, however, did not inspire confidence among physi-

cians. At the close of 1877 it had not been decided whether it was desirable to make "quinetum" in the East Indies, and the discussion caused much discontent and strife. De Vrij forced his belief in the potentialities of *C. succirubra* in the production of "quinetum" to the extent of proposing that Eydman should be sent out as "chemist to the Government plantations and manufacturer of 'quinetum.'" When Eydman got out there he was found suitable employment in the sugar industry—Moens, who was on the spot as director, holding different views to de Vrij! The next stage came in 1885, when the private cinchona planters requested the Governor-General to ascertain the practicability of exporting the crude alkaloids with the object of saving the expense of packing and transporting the worthless fibre of the bark.

EXPERIMENTS IN THE LABORATORY AT BANDOENG RESULTED IN A PREPARATION CALLED "QUINIUM," containing 60 per cent alkaloids and differing from "quinetum," in that the latter was put forward as a substitute for quinine, whilst the former was offered to manufacturers in place of the bulky raw material. Samples were distributed to the quinine factories at Amsterdam, Brunswick, Frankfort, Fouerbach, near Stuttgart, and London, and the reports made indicated that the venture was received with disfavour—the chief objections being that the alkaloids were variable, that it was very uncertain if bulk would correspond with sample, that on the freight question it would be more profitable with the freight so low, then, for the manufacturer to import good bark than a bad crude preparation, and that tho manufacture of quinine from this resinous substance was not much easier than manufacturing from the bark. Calculating on the quinine basis on the Continent, then at 5d. per unit, it was

FOUND THAT THE COST OF THE BARK ITSELF WOULD BE HIGHER THAN THE "QUINIUM"

prepared from it, so that absolutely nothing was left for the manufacturing processes in Java!

It is interesting to note that South America once proposed to export an extract of the bark, and the owner, unable to obtain his price for the substance, sold it four or five years later "without reserve." As far as the Java attempt was concerned, it was not encouraging, and no further experiments were then made. The latest, however, is Van Leersum's process for making alkaloid from fresh bark, one which some planters hold up as a Damocletian sword over tho heads of the European maker. Is it?—*British and Colonial Druggist,* May 31,

MOSQUITOES AND KEROSENE.

We live in an age of such rapid progress that the scientific beliefs of one day are the heresies of the next. We are prompted to say this after reading a long and very interesting paper, read by Surgeon-Captain F T McCabe, M.D., at a recent meeting of the Royal Asiatic Society in Calcutta on "Larvicides in Action," in which he went most thoroughly into the question of the best way of destroying the larvæ of the disease-bearing mosquito in all its varieties. We have been led to believe that treating all stagnant water, in which the mosquito breeds, with kerosene was a certain way to get rid of the larvææ, which had to come to the surface to breathe. The kerosene oil lying on the surface prevented their doing this, and the result was that they were suffocated to death. Surgeon Captain McCabe very convincingly demonstrated that this was not the case. He showed his audience a glass jar in which was water containing mosquito larvæ which had been liberally treated with kerosene oil, but in which the larvæ were as active as ever. Not only did the kerosene not kill the mosquito larvæ, but it did kill almost instantaneously the water-snail, a natural enemy of the mosquito larvæ. It was obvious that a so-called mosquito larvicide which did not effect its purpose so far as the mosquito was concerned, but did kill its natural enemies, was of little use, so that Surgeon-Captain McCabe had to set out on a search for something that did kill the mosquito larvæ, even if it did kill everything else in the water.

Poisons, such as would also affect human beings, were out of the question, so he tried the various salts of likely metals, as also salts of quinine and oil of eucalyptus. But all wore unsuccessful; the only result some had was to make the larvæ so voracious that they preyed upon each other. Eventually, by some good fortune, he hit upon chloride of lime. This in itself was harmless; but mixed with kerosene it made a compound that was deadly. Unfortunately, its beneficent action is limited. It can only be applied to small pieces of water which do not contain any fish or other useful denizens of the water. For sinks, small pools, drains, etc., it is invaluable, and has the further advantage of having an odour that discourages the female mosquito from laying her eggs in any water so treated. For larger expanses of water Surgeon-Captain McCabe made some successful experiments which point to the possibilities of electricity. The electrifying of a jar of water con-

taining mosquito larvæ with a high-tension current had little or no result, but, curiously enough, the introduction of a low-tension current had immediate and beneficial results. It must not be assumed that the work of the "Mosquito Brigades" that have been going up and down the country pouring oil on larvæ-troubled waters, has been of no effect, but the good that has resulted has not come from the oil, but from the "water tidiness," to use the word coined by the lecturer, that has ensued as a result of their ministrations. Surgeon-Captain McCabe does not suggest that he has found a complete solution for the difficulty he set out to solve, but he does claim that with the means at our command the war against the mosquito cannot be better carried out than on the lines laid down in his paper, namely, (1) the insistence upon "water tidiness" and trying to get the Indian to develop this sense; (2) the use of chloride of lime and kerosene, or electricity, in all suitable places, and finally, the intelligent use of allies, that is, the natural foes of the larvæ; and for this purpose it may be taken as an axiom that in the world of waters everything bigger eats everything smaller than itself.—*M. Mail*, June 11.

INDIGO PRODUCTION IN CEYLON.

BARON SCHROTTKY'S EXPERIMENTS: PROVED SUCCESSFUL.

OVER 100 PER CENT PROFIT.

The first manufacture of the Java-Natal Indigo grown at Lagos Estate, Kalutara, between young rubber plants, is now over and the return of dye has exceeded Baron Schrottky's estimate of 2½ lb. of Standard Natural Indigo paste per 100 lb. green plant.

The cost of cutting, transport of the green plant to the factory and of the manufacture thereof, including the chemicals, has been ⅓ of the value of the dye turned out, which is sold at 50 cents per lb. Other costs incidental with the marketing of the dye will bring the cost of manufacture to two-fifths of the value of the dye.

The rubber plants seem to have benefited from the nitrogenous deposits of the inter-grown indigo, the rubber plants among the indigo standing better than where they are quite free.

Baron Schrottky's estimate of an annual outturn of green plant of 32,000 lb. in four cuttings is considered by competent authorities, who have seen the growth at Lagos, not to be an excessive one and Baron Schrottky may therefore claim to have proved the statements made in his paper read at the meeting of the Agricultural Board on March 4th last.

He leaves the island in a few days.

FINE GROWTH OF THE INDIGO PLANT.

Baron Schrottky brought down from Lagos estate a specimen of phenomenal growth of Indigofera Arrecta, a stem 3¾ inches in circumference, the plant being 9 feet high, after having been cut down twice, sown on October 15th, 1911, and cut on June 15th, 1912. It sent to the Ceylon Exhibition.

A NITROGEN FERTILISER.

For some time past our American cousins have been making experiments with the object of conserving nitrogen in a form suitable for fertilissing the soil. They claim now to have overcome the difficulty, and some particulars appear in the "Times" supplement of 11th June. The nitrogen is collected from the air by means of electricity, and some process has been found for retaining it, presumably in a solid or liquid state, available for the purpose desired. The product is called Cyanamid, and a company of that name at Montana, U. S. A., is advertised as the manufacturers. For an agricultural country like ours a nitrogen fertiliser would be of immense importance as all plant growth is largely dependent upon the supply of nitrogen in the soil.

RUBBER IN PORTUGUESE EAST AFRICA.

In his report on Portuguese East Africa during 1911, Mr. Consul Maugham says: "Various indigenous rubber plants occur in certain parts of the Mozambique Province, the collection being principally in the hands of Indians. One British firm has obtained a concession over the extensive forests south of Angoche, but this is, I believe, the only European undertaking of the kind in active prosecution. The rubber is extracted from various Landolphia vines and is of moderately low grade; shipped largely to Hamburg, it is worth, perhaps, not more than 3s. 6d. to 6s. per lb. Large quantities of Ceara rubber have been planted in the Quilimane district, and appear to be developing satisfactorily. I regard it as quite impossible for European associations and individuals to compete for the purchase of indigenous rubber with the Indian trader. Such attempts as have been made have invariably resulted in failure. The collection of the product is thus made by Asiatics, who either dispose of it to European trading firms or ship it direct to Europe on consignment.—*H. & C. Mail*, June 14.

JAPANESE TEA TRADE.

The 1912 tea season opened a week later than last year, owing to the cold weather that prevailed at the time the tea leaves of the early districts were tender and also to the frost that followed the cold spell. The unfavourable weather, however, affected only the early districts; so the tea from those districts is poor both in quality and style. However, traders are expecting good quality and an abundant crop, as the weather is quite normal and there is no insect injury, so far as the first crop is concerned.

The price of new tea is higher than last season by 15 to 20 per cent., due to the high price of rice and other necessaries, while, on the other hand the American market, which is the best customer of Japan tea, has been and is in a very discouraging condition. It is a very peculiar phenomenon, indeed.

Already quite a number of American buyers are in Shidzuoka, and as long as they are in the business they have to face the conditions that prevail in the Japanese market. For that reason some of the foreign buyers bought a fairly good quantity of early teas and have shipped by the "Empress of India," which sailed from Yokohama, April 30. These early shipments are simply intended to lay in new stock on the other side; consequently shippers do not expect to make any profit, only to please their clients at home.

After the sailing of that boat, the market showed a slightly downward tendency, falling about 5 yen per picul, yet 10 or 12 per cent. higher as compared with the corresponding period of last year. The market is still ruling high, and therefore most of the American buyers are waiting for the time when the market will settle down nearer to normal condition.

Some of the foreign buyers have a pessimistic view as to the future of Japan tea, if the price goes up as it has done for the past five years, because the consumption of Japanese green tea in the United States and Canada will decrease on account of too high prices, and the inflow of Ceylon or Indian teas, which are formidable rivals of Japanese tea.

Shidzuoka, May 5th.—According to the market reports received by American buyers now in Shidzuoka, the Japanese green tea market in their country is unquestionably overstocked with tea of last year, and in consequence a number of wholesale houses and jobbers are still holding large quantities of old teas, and these holders are very anxious to get rid of the goods even at a great sacrifice.

Not only many foreign buyers, but native refirers, are indignant over the injudicious act of Messrs. Whitney & Co., who bought 200 half chest quantity of new tea at the very beginning of the season, paying an exorbitant price, this creating a high and abnormal market.

Another reason for the high market is that year after year there is an increase of refirers, mostly natives, who, once started in firing, wish to keep their plant running for the entire season; consequently they buy, disregarding the high market.

Shidzuoka, May 9th.—The daily arrival of raw leaf at Shidzuoka is about half the quantity compared with that of the corresponding period last year. This is mainly due to the lateness of the season by at least one week or more.

It is rumoured that the well-known firm Mitsui Company will start handling Japanese tea, besides the Formosan tea which is exported to America year after year by the Company on a large scale.—*Japan Times*, May 11.

TEA GROWING IN RUSSIA.

The Imperial Russian Domain has an estate at Chakva, near Batoum, where successful experiments are being carried on in the cultivation of tea, oranges and other fruits, and Bamboo. So far, it is said, no official reports on the results accomplished have been made public, but an exhaustive report is in preparation for an industrial exhibition to be held at St. Petersburg during 1912, where the resources of the Caucasus will be exploited. The property consists of 43,200 acres and covers what was formerly a hopeless tangle of rank vegetation. During the past few years a considerable portion of the territory has been cleared and improved, and has become one of the most attractive and healthful districts on the east coast of the Black Sea. The estate, according to the American Vice-Consul at Batoum, has a western frontage of about two miles along the sea. From there it stretches eastward, and is enclosed at its extreme limits by a semicircle of hills that give protection against the cold winds sweeping down from the mountains. The greatest altitude of the hills immediately surrounding the estate is about two thousand feet. The soil is principally red clay, black earth and sandstone. There is an occasional sprinkling of limestone. Tea-growing began on the estate in 1890. The most promising ground was cleared and

the work put under the direction of expert tea growers. Members of the Imperial Domain's staff were sent to China, Japan, India and Ceylon to acquire practical knowledge of tea growing. Experienced growers were also brought out from China, and one of these still romains, as manager of the tea plantations. Tea-growing has now passed beyond the experimental stage. The annual crop averages about two hundred thousand pounds. About twelve hundred acres are devoted to tea culture. The fields are partly on the plains and partly on the low hills, which in some cases have been terraced as a protection against erosion. During the early experimental stages about three thousand tea bushes were planted to the acre. This number has been increased, until as many as four thousand four hundred bushes are now crowded into the acre. The tea plantations are being extended at the rate of about one hundred and thirty-five acres per annum. The leaf is picked four times during the season. The first picking yields tho superior quality, although the second is more abundant. The leaf is cured in a modern factory, where every care is taken to obtain cleanliness. The cleaning, curing and packing are all done by machinery, which is mostly English. The sanitary conditions are excellent. The Chakva tea somewhat resembles in taste the teas of Ceylon and India, although it cannot be said as yet to have reached the excellence of the best of these. The Russian tea is sold principally in Poland and Central Asia. Shipments of about one thousand pounds have been sent to America on one or two occasions, but no regular demand appears to have followed.—*Royal Society of Arts Journal*, May 31.

THE PALM-SAP INDUSTRY OF THE PHILIPPINES.

The aboriginal Philippine tribes for hundreds of years—probably since long before the advent of white people among them—have made alcoholic drinks from the saps of certain palms, among them the nipa palm, the coconut palm, the sugar palm, and the buri palm. It has long been known that the sugar possibilities of some of these palms merited investigation. In fact, investigations into the sugar possibilities of some of them have been made in past years, notably into the merits of the coco palm in Ceylon and the sugar palm in Java, while sugar is now actually made from the coco plam by the natives of the Philippines. According to the returns of Internal Revenue Bureau of the Philippines, about 93 per cent of the entire output of alcoholic beverages produced in the Philippines in 1910 came from the sap of palms, the production noted by the authorities amounting to about 2,062,000 proof gallons. The industry is greatly on the increase. About twenty-two beverages are manufactured from these saps. As a rule, they are well-known native drinks, or imitations of well-known foreign drinks. The most popular, known as anisette anisado, vino de coco, and vino de nipa, contain 10 to 55 per cent of alcohol. In addition to the above, a vast amount of palm sap is consumed without distillation. Nevertheless, the production of alcohol from these palm saps is developed to only a fraction of its possibilities. There are not only vast areas of palms suited to the production and accessible, which are yet untouched, but the cost of production, under even present crude conditions, is small, compared with the cost of producing alcohol from other sources. From the standpoint of alcohol production and of sugar production, the principal palm is the nipa palm. The nipa is an erect, stemless palm, of which the leaves and inflorescence rise from a branched root stock, the leaves running from nine to thirty feet in length. It grows along the tidal marshes of rivers in low, wet lands, subject to overflows of brackish water as the tides rise each day, and it will not thrive where either fresh or sea water alone is available. Nipa swamps of considerable size occur practically throughout the Philippines, and, inasmuch as they occur in lands which otherwise are useless or almost without value, the cultivation of nipa palms where they are cultivated, or the presence of nipa trees wild where not cultivated, affords a profitable crop on little original outlay. The sugar-making possibilities of these saps, considered commercially, seem to hinge largely upon conditions under which the sap can be gathered and handled. The saps of the three principal sugar-bearing palms, the nipa, the coco, and the buri, run remarkably close together in composition. The sap from these trees, as a rule, is obtained through the flower stalk. In the nipa the flower stalk is cut off immediately below the fruit. It is generally tapped the fifth year. Each day a thin slico is cut from tho severed stem, to keep the wound fresh and facilitate the flow of sap. Tho sap is collected in bamboo joints hung on the stem, generally having a capacity of about two quarts. One stalk normally flows about three months, but it is not uncommon for it to be cut entirely away by the thin slices from day to day long beforo the flow has ceased. In some districts the plant is cut before the fruit forms, and the flow of sap is increased thereby, so far as daily output is concerned, but the length of the flow is shortened—the total yield of the plant apparently being about the same by either method. The plants are allowed to rest and put forth new fruit stalks, after being thus exhausted. How long they continue to bear is uncertain, but all authorities agree that a plant will continue to produce sap for many years, probably for fifty years or more, on an average. Tho yield of sap also is uncertain, and estimates vary between wide limits. An experienced distiller says that each plant will average about three pints daily. The yield and quality of the sap can be improved by seed selection and a measure of cultivation of the plant. The sap, as it flows, is clean and almost colourless, and very sweet to the taste. Fermentation commences so soon after the sap exudes that many distillers believe that yeast germs are present in the sap; but the immediate fermentation is explained, to some extent, by the fact that the receptacles for the sap are used over and over again, without cleaning. When the sap is collected in clean vessels it undergoes no change for four or five hours.—*Royal Society of Arts Journal*, May 31.

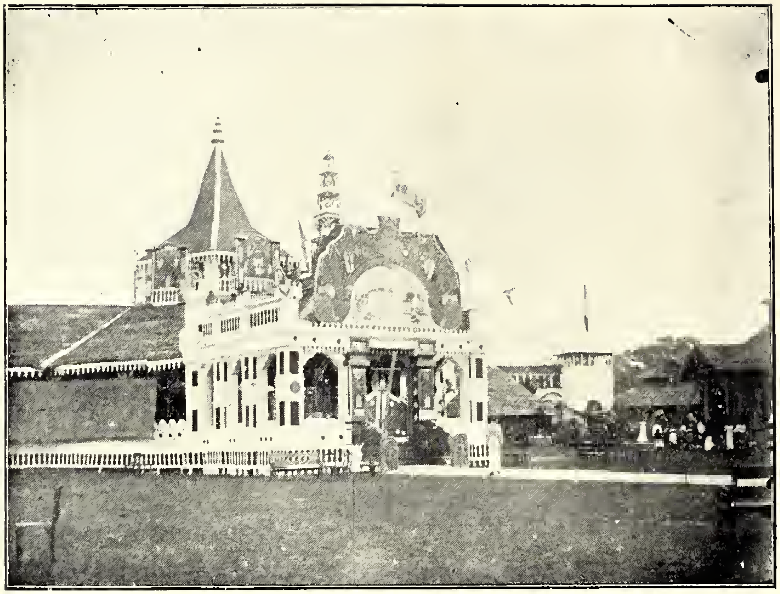

Photo by R. H. Ferguson.

ALL-CEYLON EXHIBITION, 1912. THE KANDYAN PAVILION.

Photo by R. H. Ferguson.

ALL-CEYLON EXHIBITION, 1912. LOWCOUNTRY PRODUCTS ASSOCIATION PAVILION.

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ELEVEN GOLD MEDALS

THE ALL-CEYLON EXHIBITION.

The first All-Ceylon Exhibition was held in Colombo from July 1st to 6th and was voted a complete success.

His Excellency the Governor—in declaring the Exhibition open—stated that it was essentially the people's Show—it was for the people, by the people and with the people. In conclusion His Excellency alluded to the Exhibition as "Lanka Town," and wished it every success.

Their Excellencies were then escorted round the Show-grounds by the officials.

A Brief Description of Some Sections.

The Ceylon Exhibition. It is magnificent, but it is bewildering. The island's products, and arts, and industries, are compressed in the small space of an exhibition ground, and the ensemble is stupendous. For the first time in the history of Ceylon its characteristics have been tagged and labelled, and collected on such a scale, and it is beyond description. Every section of the island has vied with the rest in its endeavour, not necessarily to flaunt its local patriotism, but to show what it is capable of. And the result is a dazzling agglomeration of fruits and crafts, jewels and productions, that one cannot help but realise that it is the land poetically described as the "Garden of Eden" and the "Jewel of the Eastern Seas."

Where East Meets West.

"East is East, and West is West, and never the twain shall meet," but the twain have met in the bonds of industry, and the native handiwork lies in close proximity to the handiwork of the men of the West, Rubber, manufactured Tea, and the imported goods of Europe. And yet after all it is the East, for nowhere else would one find such a contrast in colours, and such a heterogeneous collection of scents and smells.

A World of Flowers.

One enters the Exhibition through a porch of bamboo draped with green vegetation, that is streaked with a Euclid problem in silver, which catches the shimmering rays of a powerful sun, sending scintillating flashes after the manner of some bewitched heliograph. Immediately one enters one passes into a land of flowers. There are flowers everywhere, peeping from clusters and masses of emerald green, and standing boldly in solitary grandeur. There is no need for exotics here, and the brightly splashed blooms, grown in their natural temperature, exude a languorous scent which is alluring in spite of its oppressiveness. Passing through the flower section the eye is positively assailed by a wonderful collection, ranged on either side of the great main building. It is difficult to know where to go first, and the visitor would be well advised to make no definite pro-

gramme, but to make a start where the crush is least.

RUBBER AND TEA.

First of all there is rubber, and tea, which must claim first attention from the European. Here there is biscuit, sheet and crepe from many estates showing the different methods and varied patterns adopted. Away down a long line they lay, and one passes some very creditable specimens.

Tea is also there in its many phases, neatly packed in lead lined boxes, and lead packages. There is a strange scent of tea which would bring joy to the heart of any English housewife. Vegetables vie with Ceylon sauces, and sweetmeats. The art of the Sinhalese is displayed in clever carvings, and statues, the latter section including one of a lowcountry Sinhalese Paddy cultivator. The inevitable elephant is also there in assorted sizes. The heart of the sportsman will warm at the stand showing cheetah skins and other specimens of Ceylon game, while a full grown specimen in a glass case should attract a good deal of attention. Elephant tusks, heads and cobra skins are also there.

THE SCENT OF THE PINES.

Lace, home industries, and a hundred and one things are displayed. There is a fine collection of fruit, and the scent from hundreds of pineapples fills that end of the building. There are pines, some of them nearly a foot-and-a-half long, plantains, mangosteens, coconuts and their products and all "the luscious fruits of the East."

THOU SHALT NOT COVET.

The gem section is a coruscating and flashing scene of brilliance. There are gems of all varieties, and heavy gold ornaments which must cause many breakings of the tenth commandment. The chief import firms also have some fine stands in this building who certainly deserve to be congratulated on the artistic ability of their designs.

A BLAZE OF COLOUR.

Outside this erection the visitor is staggered with colour. The various sections of the island each have their pavilion where the local industries and their effects are shown. The architecture of the erections is amazingly daring, and the colour scheme would bring joy to the heart of any post-impressionist or futurist. The designers are by no means nervous, and bright reds and yellows are used with somewhat startling effect to the Western eye. The local commercial firms also have their pavilions, and the white painted wood stands out in sharp contrast to the brown cadjan and the luridness of the native initiative.

THE MAIN BUILDING.

It is interesting to note the dimensions of the main building, which is 500 feet long by 200 feet wide, the diameter of the centre circle being 60 feet. It was designed by Mr. E. F. VanDort, who also designed the Dutch House and supervised the construction in this case. The abbey-like gallery windows are an interesting introduction to this cruciform building, with its splendidly lined colonnades of pillars all dead true from end to end. The rounded ends and excrescent additions near the centre do not detract at all from the massive picturesqueness of the form of the main building—the right arm of the cross of which forms the main entrance, with its none too impressively large gilt lettering "ALL CEYLON EXHIBITION: UNDER THE PATRONAGE OF HIS EXCELLENCY THE GOVERNOR."

THE AGRICULTURAL DEPARTMENTS EXHIBITS.

The Agricultural Society have an exhibition that should be missed by no one interested in the cultivation of either rubber or tea, or any of the products for which Ceylon is famous. Here may be seen the effects of light and air on rubber, and specimens of insects which cause damage to the trees. In connection with the former some interesting specimens are shown, these including a large block of Lanadron rubber which was exhibited at the Ceylon Rubber Exhibition in 1906 and has since been exposed to light and air at the Peradeniya Museum. The placard is labelled

"WILL PLANTATION RUBBER KEEP?!"

and the answer is supplied by the rubber itself which appears to be in good condition, while another sample is from Henaratgoda from one of the original trees which has been kept for 29 years. This, of course, has very little of the appearance of rubber about it, but it shows to what an extent rubber will keep. Some Hard Para rubber is also staged; samples of biscuit, crepe and sheet rubber also being shown together with a biscuit of mud rubber. The results of slow drying are depicted by several pieces of rubber treated differently, another specimen illustrating tackiness produced by oxidation with Potassium Permanganate. Some Ficus rubber from the 1906 Exhibition and Hevea latex preserved by Formalin and Ammonia, are interesting as are also the exhibits of Castilloa, Ceara and Manihot Dichotoma, crepe rubber, and some of the record yields from Henaratgoda. Grass oils and nutmeg are shown preserved, as well as cocoa, rubber and castor oil seeds. A large pot of Baron Schrottky's indigo paste is staged on this table. The Sumatra tobacco from Maha-iluppalama should prove interesting in view of the agitation in favour of tobacco cultivation in the island at present; at this place it may be remembered there is an experimental station. In connection with tobacco it is interesting also to note that in the main building of the exhibition there is a good show of Ceylon tobacco, and the cigars, manufactured from it, have the appearance of an Indian cigar, though not of the first-class it must be said. Paddy, poonac and logwood are also shown.

DISEASES OF RUBBER AND TEA PLANTS.

To the planter perhaps the most interesting portion of the exhibit will be that relating to diseases. In this section are cuttings and branches showing the ravages of insects on both tea and rubber trees, one tea bush being shown with the trunk hollowed out

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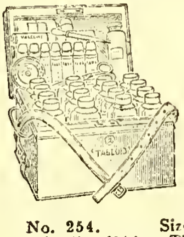
MEDICAL OUTFITS

In his book, *Scouting for Stanley in East Africa*, Thomas Stevens wrote: "Stanley, in recommending these ('TABLOID') medicines, has earned the gratitude of every man who goes to a tropical country."



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by white ants. Shot hole boring beetles are also responsible for a good deal of damage, while there is also a good illustration of the "Nodule" disease in rubber trees. Carpenter bees are wretched pests and the tremendous holes bored by these insects are indicated in sections of trees, specimens of the male and female of the bees being shown. The huge coconut beetle and other insects should be seen by those who are anxious to deal with these pests. Some fine cases of commercial silk worms and cocoons are on view, including the eri silk cocoon and the mulberry silk worm. There are specimens of the old rubber prickers, and tapping knives, the latter being shown in their various stages up to the modern implement.

The method of tapping toddy should prove exceptionally interesting to those engaged in the Excise controversy.

In the same pavilion is an interesting exhibit showing the evolution of the mosquito, a number of microscopes illustrating particular features adding to the value of the lessons which are to be derived from such a show.

SEEDS STORE.

In a spacious cadjan structure on the side of the main building stands the seed store, which is run by the Ceylon Agricultural Society and supervised by Mr C Drieberg. There were nearly 200 different varieties of paddy alone and a very large number of other varieties of seeds, fibres, etc. Each exhibitor received from the Society a packet of vegetable seeds. There were also on view a good collection of agricultural magazines and pamphlets (local and foreign) which visitors were entiled to read.

FRUITS.

The fruit stall was tastefully arranged at a corner of the main building, and consisted of every variety of fruit. Most of them were much bigger than the ordinary ones to be seen in the markets and looked very tempting. There were pineapples, mangosteens, many varieties of mangoes, limes, plantains, etc., etc.

LOWCOUNTRY VEGETABLES.

The native products cultivated in the lowcountry were placed outside along the main building. They consisted chiefly of vegetables—fruits and herbs, without which the native cultivator cannot exist. There were some record sized yams—one a tapioca, being four feet in length. There were jaks of enormous size and some herbs, which showed that they enjoyed a very luxurious growth. There were also different varieties of yams, beside numerous table vegetables. The brinjals, breadfruits and pineapples were conspicuously displayed, and their sizes surprised everybody who passed by.

UNCULTIVATED VEGETABLE PRODUCTS.

These were neatly arranged, too, in the main shed, and the stall reminded one of a native pharmacy with rows and rows of bottles of medicinal oils. There were also other kinds of oil such as the mi oil, the kekuna oil; samples of seeds, dye stuffs, gums and resins, tannery mat-

erials, wild fibres, jungle ropes, specimens of bark cloth dried and green, etc. The judging did not take place till late as the judges were elsewhere engaged.

CUT FLOWERS.

There were exhibits of roses, violets, gladiola, carnations and other Upcountry flowers. The specimens were good, but were woefully battered by the journey, and also showed signs of decay from rain.

THE SILK HOUSE.

The special show made by the Salvation Army was very attractive. There was an oxhibition of worms, how they feed, and spin cocoons fe d• ing worms and the eri worms. When the cocoons are made they are reeled to a machine which is placed at hand and then they are spun into thread. After this process the thread is made into skeins and is ready for exportation. A Loom for weaving cloth was also on the premises, and cloth weaved at the place was exhibited. Another little quick running machine for spinning eri cocoons was also shown as well as a little machine for purifying the eri cocoons. On a table in the centre there were arranged samples of the Bengal variety, the Mysore variety and the "cross-breeding" variety of silk thread. The medals won by the Association were also on view. The collections consist of a gold medal for the loom, and four silver medals also for the same loom.

CEARA RUBBER NOTES FROM SOUTH COORG.

Pollibetta, June 29.—. . . . . Both coffee and rubber present a most luxuriant aspect. Borer is not severe this season. Estates are fairly well supplied with labour for the time of year and most seasonal works are well in hand. The supplying up of vacancies in the rubber has in some cases been finished and in others is in progress. Myriads of rubber plants grown from dropped seed cover the ground, and in parts form the only growth beside the Ceara trees. Rubber trees still continue to succumb to what is popularly attributed to "stump rot." Numbers of them are being removed and burnt, "supplies" taking their places. In a year these in turn succumb. Too luxuriant growth is a menace to the well-being of the trees. They develop a heavy head of branches and foliage the weight of which splits their stems down to the ground. The judicious lopping of branches might prevent this. The habit of growth of Ceara trees varies widely, indicating that a number of varieties are extant. Some branch out very near the ground and are unsuitable for tapping others have long straight stems. Some have a weeping willow appearance, while others throw their branches upwards in candelabra fashion. These are said to be the most productive. The undesirable kinds will be gradually eliminated. The places are being got rid of undesirable growth and in some cases digging has been commenced.—*M. Mail.*

COMMERCIAL SYNTHETIC RUBBER.

PROFESSOR PERKIN'S DISCOVERY.

Considerable interest had been roused when last mail left London over the reported production of Synthetic Rubber by Professor Perkin and the flotatation of a Company to carry on its manufacture. Later news by cable intimating that Professor Perkin's new synthetic rubber was to be produced on a small scale at first, and that the necessary shares for allotment had been taken up in the new Company, gives no intimation that there has been an enthusiastic response to the flotation; further, the steady, though not active, market in plantation rubber shares ever since the announcement of the discovery, indicates that those who are handling and investing in raw rubber accord little weight to the so-called scare. The fullest, though of course the most technical, report of the meeting of June 17th at Burlington House, when Professor Perkin described his discovery to the Society of Chemical Industry, appears in the *Chemist and Druggist* of June 22nd, and in view of its importance we reproduce it in full. We notice that our contemporary's representative extracted from Sir William Ramsay the statement that growers of rubber need have no fear that the market would be affected for many years, and that the production of synthetic rubber was quite a side issue for the present compared with the manufacture of acetone and fusel oil; but he did not state, either then or at the lecture, whether any quantity had been produced sufficient to be tested in those *essential qualities of natural rubber*, in which it had so constantly been stated that synthetic was almost perennially doomed to failure. We refer to "elasticity," "resilience," and "tensile strength," three qualities in the raw product which the buyer and manufacturer invariably examines it for, and from which he makes up his price. We, therefore, take the view that the prominence given to the production of synthetic rubber, as if it were anything likely to compete with plantation rubber, is unwarranted. To take only one authority, viz., Mr. Hermann Gardner, F. C. S., who writes in the *Financier* on June 20th that the great weakness of all synthetic rubber products hitherto is their readiness to unite with atmospheric oxygen in the presence of light, and consequently they suffer speedy deterioration. There is also a network of nitrogenous material in raw rubber, which is missing in the synthetic variety; and until the vulcaniser gives his verdict that the Perkinette rubber is able to stand vulcanisation, any fears of it as a competitor may be removed to a date as far distant as the Greek Kalends.

The most that may be expected is that the new product, when turned out in appreciable quantities, and provided that its cost is limited to one shilling or one and sixpence, will be that it will displace the commonest African and South American natural product. The main advance secured by Professor Perkin and his colleagues, is that fusel oil, an expensive product, is cheaply obtained, together with ace-

tone, by the fermentation of starch, by means of certain bacteria; and the isoprene without which "synthetic" is impossible, hitherto obtained by condensing turpentine, is now obtained from iso-amylatropol, a constituent of fusel oil.

It may be found that Professor Perkin is relying too much for cheapness of production on the possible sale of by-products, the market for which is not always easy to find, and still more easily dislocated when these begin to be turned out in unwonted quantity.

PROFESSOR PERKIN'S PAPER.

A meeting of the London Section of the Society of Chemical Industry was held at Burlington House on June 17. Mr E Grant Hooper presided over a crowded meeting. The first paper, by Professor W H Perkin, F.R.S., was entitled "The Production and Polymerisation of Isoprene and its Homologues," and turned out to be an extremely interesting account of the work of an English committee of chemists and bacteriologists undertaken with a view to the

PRODUCTION OF SYNTHETIC RUBBER ON A COMMERCIAL BASIS.

As the story was unfolded in dramatic sequence it proved that our chemists are as virile as ever, and it completely vindicated the early work of English chemists upon the authenticity of which some doubt has been expressed in Germany. Professor Perkin began by explaining that at the end of 1909 a group of chemists and bacteriologists was formed by Mr E Halford Strange to study the production of synthetic rubber. At the head of the group was Dr. F E Matthews, who suggested a method of preparing isoprene in which acotone and later fusel oil were employed as the raw material. The lecturer had at the same time devised a process starting from glycerin, and this led to an alliance. A committee of fifteen chemists was ultimately formed, with Sir William Ramsay as consultant, and Professor Fernbach, of the Pasteur Institute, Paris, as bacteriologist. Professor Perkin reviewed the work of the earlier investigators to prove, in view of statements made by the Bayer Co., that much pioneer work in this field belongs to this country and France. A careful search has been made of the literature of the subject, the chief events being:—

1860. Greville Williams isolated isoprene and observed its transformation into a rubber-like body.

1875. Bouchardet proved that rubber is a polymer of isoprene, and in

1879 prepared isoprene from turpentine.

1882. Tilden first polymerised isoprene into rubber by the action of hydrochloric acid and nitrosyl chloride. He also suggested the correct formula for isoprene. In

1884 he further investigated the production of isoprene by the pyrogenic decomposition of turpentine, and in

1892, in a paper before the Birmingham Philosophical Society, showed that synthetic rubber is capable of being vulcanised.

Professor Perkin then drew attention to the

HISTORIC SPECIMENS OF ISOPRENE PREPARED BY SIR WILLIAM TILDEN,

which were on the lecture-table. One specimen in a bottle hermetically sealed had become syrupy, and another to which air had had access was dark-coloured and had become converted into rubber. This was proved by sticking into it a glass rod, to which it adhered and showed its elasticity. Continuing, the lecturer recounted that in 1907 and onwards the high price of rubber stimulated research with the object of preparing rubber synthetically. Tho Bayer Co. in 1908 obtained a patent for a method of polymerising isoprene by means of heat, but the patents up to this time did not contain much that was not known before. Experimental work of Kondakow, Motiewsky, Thiele, Harries, and Klages was referred to, these chemists employing compounds containing the conjugated double linking —C=C—C=C— which is usually connected with a tendency to polymerise. Then followed a dramatic episode in the almost simultaneous discovery of the scientific fact that isoprene can be readily polymerised by means of sodium. In September 1910 Dr. F. E. Matthews observed that isoprene which had been left in contact with metallic sodium since July had turned into a solid mass of rubber. Professor C. Weizmann had also suggested that dimethylallene could be converted into rubber by means of sodium. Further investigation proved that sodium is a general polymerising agent of first-rate importance. The first announcement of this discovery was made by Dr. Carl Harries, of the Bayer Co., but when Dr. Harries applied for an English patent he found that he had been

COMPLETELY ANTICIPATED BY DR. MATTHEWS'S APPLICATION

three months before. The polymerising action of sodium is practically quantitative, and is not seriously affected by impurities. It will take place in the cold or in moderate heat, which is an advantage. The lecturer then called attention to some tubes of isoprene in which had been immersed for varying time a spiral of sodium wire. Selecting one which had been in contact for five days, he pointed out that tho sodium had been broken down to a powder, and a viscous mass had formed at the bottom. The lecturer's assistant then precipitated the rubber by means of acetone and exhibited a mass of rubber to the audience. The rubber was snowy white, but, it was explained, becomes transparent aftor standing for some time. This discovery renders the production of rubber possible if di-vinyl or erythrene isoprene, di-iso-propenyl, butadiene, or other similar compounds containing conjugated double linkings can be prepared cheaply. Various raw materials were suggested. It was thought that the "cracking" of petroleum spirit was a promising source of the hydrocarbons, but the yield was less than from turpentine, and there were present many other bodies which made the purification a costly matter. The supply of turpentine is limited, and, therefore, subjected to great fluctuations of price. In surveying the various organic substances which could be employed the fact was kept in mind that rubber may

be sold soon at 2s 6d a pound, and the synthetic product must be able to compete with natural rubber at 1s. a pound. The

ONLY CHEAP RAW MATERIALS AVAILABLE ARE WOOD, STARCH OR SUGAR, PETROLEUM, AND COAL.

Wood yields acetone on distillation, but the quantity available is limited and is already in such demand by various Governments for use in making explosives that the price has risen to £90 a ton. Petroleum and benzene from coal were likewise dismissed for other reasons. There then remained starch and sugar, the former of which can be obtained cheaply in any quantity. First a complete process was worked out from lactic acid, but it is too complicated to form a paying proposition; then attention was directed to starch, from which amylic alcohol is prepared. Iso-amyl-chloride was prepared, the chlorination being effected by a special apparatus. There are produced three dichlorides, which all yield isoprene when passed over hot soda-lime, so that they do not require separating. This method was proved to yield excellent rubber, but the world's supply of amylic alcohol is limited; at present it is about 3,500 tons, and costs £140 a ton. To meet this difficulty Professor Fernbach, of the Pasteur Institute, worked out a process of fermentation directed to producing a larger proportion of higher alcohols by using certain nitrogenous compounds. After eighteen months' work he has perfected a method which produces not only fusel oil, but acetone. The production of acetone by this process is of enormous importance, and is expected to bring down the price to a third. The fusel oil obtained contains a large quantity of butyric alcohol, and can be made at a cheaper price than £45 a ton. The interesting part is that butyric alcohol, from which butadiene is made, is even better than isoprene as a source of rubber. The process as finally worked out has been checked and confirmed independently by Mr. Otto Hehner.

DISCUSSION.

In the discussion satisfaction was expressed at the full justice done to Sir William Tilden, and Sir William referred to the discovery as a great commercial source of wealth to this country and the world.

Sir WILLIAM RAMSAY—said he could not help feeling how easy it is to do a thing when you know how, and recalled that in 1874 to 1879 he was working on the pyridine derivatives and employed sodium as an oxidising agent in the manufacture of dipyridine.

Professor ERHARDT—of the Badische Anilin- und Soda Fabrik, said, if his memory served him aright, the date of Sir William Tilden's polymerisation of isoprene had been understated. His company began work on the subject three years ago, the result of which will be known shortly through the published patents.

Mr. REID—said that there was no reason why the output of turpentine should not be greatly increased. Russian turpentine only differs from American turpentine in the crude methods employed in its preparation, but from it isoprene and butadiene can be as easily produced. He mentioned that he had lately seen a method of great promise of converting heavy residual petroleum into light spirit suitable for motor spirit. The product is an excellent solvent of rubber.

Dr. R. MESSEL—said when in Germany a few days previously his attention was drawn to the tyres of a motor-car. Those made of synthetic rubber had outworn the Para-rubber tyres.

Dr. P. SCHIDROWITZ—said the lecture had shown conclusively that the production of pure rubber synthetically is no longer bunkum. The commercial aspects have, however, yet to be considered before certainty can be said to have been attained.

Professor PERKIN—briefly replied.—*Chemist & Druggist*, June 22.

Views of Professor Dunstan.

(*To the Editor*, "*The Times*.")

SIR,—The accounts in the Press of the new process of obtaining synthetic "rubber" are so wanting in detail and clearness that it is well to draw attention to one important point.

Although methods of obtaining rubber from isoprene were mentioned by Professor Perkin, it now appears, from published statements, that the principal process consists in obtaining not true rubber from isoprene, but a rubber-like material from a different hydrocarbon known as butadiene. Isoprene contains five atoms of carbon in its molecule, and is convertible into the chief constituent of true rubber which contains in its molecule a multiple of five atoms of carbon. Butadiene, on the other hand, contains only four atoms of carbon, and the rubber-like material obtained from it will, therefore, contain in its molecule some multiple of four atoms of carbon. The material in question is therefore not identical with the chief constituent of natural rubber, from which it differs in composition and molecular weight, and is what is known in chemical language as a lower "homologue" of true rubber.

It is perfectly well-known that homologues exhibit properties, especially physical properties, which differ more or less widely although such substances usually bear a close family resemblance.

The new material may, from the practical point of view, prove to be better or worse than natural rubber, but it is important to point out that it is not the same thing, and that, so far, definite information is wanting as to the respects in which it corresponds with natural rubber in such important properties as resilience, tensile strength, &c. Except for a few observations published by Professor Harries, of Kiel, we are at present in ignorance of the precise properties of the new substance, which, moreover, has not yet been produced on a large scale.

Apart, therefore, from the question referred to in your article of yesterday of the cost of producing the new material in comparison with the cost of producing natural rubber, it is evident that the product of the new process is a new substance, with whose physical properties we are not yet fully acquainted.

The material in question is not rubber, but a homologue of rubber, and should be known by another name. "Homo-rubber" is barbaric in structure, but it may serve until a better name for general use has been devised.

WYNDHAM R. DUNSTAN, F.R.S.

Imperial Institute, S.W., June 19.

Further Points to be Determined.

MR. BERTRAM BLOUNT,

who was present at the reading of Professor Perkin's paper on Monday, in discussing the situation with a *Morning Post* representative yesterday, said: "The large attendance of chemists at the meeting and the character of the discussion which followed on Monday both show how keenly the interest of English chemists has been aroused in Professor Perkin's announcement. The record of the work done is elegant, both from the standpoints of the chemist and of the bacteriologist. The chemists may congratulate themselves on the discovery that the addition of slight quantities of sodium is able to transform isoprene, or rather, in the present instance, butanediene into rubber or a substance closely resembling it; and the bacteriologists have equal cause for pride in having found a bacterium that is capable of transforming saccharified starch into acetone and butyl alcohol. I must confess to a feeling of surprise at the latter result. Butyl alcohol contains four carbon atoms, whereas ethyl alcohol, the ordinary substance produced as a result of fermentation, has only two. Now the greater the number of carbon atoms contained in an alcohol, the stronger is its toxic effect, and one would have expected that the bacterium effecting the change would have been overcome by the products of its activity long before it had been able to complete its work. One can only say that it proves itself to be of a most hardy type, and that Professor Fernbach deserves all praise for his work."

ATTITUDE OF THE PLANTERS.

"Considering the announcement more generally and criticising it, I feel bound to say that there are a few points on which we require further information before we can make anything in the nature of a dogmatic statement. It will be noticed that in his process Professor Perkin derives his rubber-like substance from a body with four carbon atoms, whereas isoprene, from which rubber has hitherto been synthesised, and rubber itself both have five carbon atoms, or in the case of rubber a multiple of five carbon atoms. One wants to know whether the rubbery substance derived from the four carbon body will have the same actual commercial uses that the naturally grown substance possesses. Again, in considering the effect of the discovery on a great industry, it must be borne in mind that the rubber planters are a powerful organisation and will not probably be caught napping, as the indigo planters were about a decade ago. No one in the city, at any rate, knows the real price of rubber. We have seen it fluctuate from two to twelve shillings, but neither figure has been the natural price of the substance. The effect which the artificial rubber will produce depends, not only on the price at which it can be produced, but also on the true economic price of naturally grown rubber; that is to say, on the price at which it will pay to grow and sell the natural rubber.

"A further point to remembered is the source from which the rubber is to be obtained, starch. Starch is not a substance that can be got out of the earth like coal or petroleum, but one which has to be grown, as rubber has to be grown. This point was raised at the Society of Chemical Industry. It is partly met by the statement that starch in the form of tubers of one kind or another can be grown practically anywhere and in very large bulk per acre, but the fact has to be remembered that the raw material of synthetic rubber is a substance that requires to be raised at considerable expense. An experiment of considerable interest would be to polymerise both isoprene and butanediene with sodium and compare the two products thus obtained with each other and with natural rubber. Considering the fact that natural rubber is not a pure substance, but contains a considerable percentago of resins, much as turpentine, for instance, does, it is a bold statement to say categorically that rubber is polymerised isoprene, though the evidence may be admitted to point in that direction.

"To prevent misconception, I should like to add," Mr Blount continued, "that these criticisms take nothing away from the extreme elegance of the process which Professor Perkin described to us on Monday night. At the first announcement of such a process there are bound to be a number of such points as I have indicated arising, and time only can show how far the new process is able to hold its own against the severe test of commercial competition. In any case, the paper will always be regarded as a record of great scientific achievement."—*M. Post*, June 20.

Probable cost and selling Price of Synthetic Rubber.

(To the Editor, "FINANCIAL TIMES.")

Sir,—It has been obvious during the last few days that Professor Perkin's statements as to these points have not been clearly understood. As organisers of the research group represented by Professor Perkin at the lecture to the Society of Chemical Industry on Monday night last, we make the following statements :—

The process for the manufacture of synthetic rubber employs starch-containing substances as the raw materials. The starch in maize costs on the average less than 1d per lb. Only five operations are required to convert the starch into rubber, and these are known to proceed easily giving good yields. The only other materials required are common salt, costing, say, 30s per ton; lime, costing, say, 30s per ton; coal costing, say, 15s per ton. The total cost for the raw materials to make 1 lb of rubber does not exceed 2d. With such cheap and plentiful raw materials it is obvious that there is a large margin for manufacturing expenses if 1s per lb is taken as the cost price. In fact, it is probable that when experience has enabled the large scale plant to be

perfected, the manufacturing cost will be reduced to between 4d and 6d per lb. Professor Perkin suggested that 2s 6d per lb would be the probable selling price for some years to come. This calculation is based on the following considerations:—It is probable that at a selling price of 2s 6d per lb more than half of the world's output of rubber would become unprofitable to collect. This would include the bulk of the wild rubber, including Para. It is, therefore, probable that the first phase of the inevitable struggle will be to leave the field divided between plantation rubber and synthetic rubber, and there is, of course, the possibility that, with the demand for rubber steadily increasing, it will be some years before it is necessary for the manufacturers of synthetic rubber to lower their prices to such an extent as to seriously interfere with the plantation industry.—We are, &c.,

For Strange and Graham, Ltd.,

E. HALFORD STRANGE, Director.

50, City-road, E.C., 20th June.

—*Financial Times* June 21.

MORE SUBSTITUTES AND SYNTHETIC RUBBERS.

A SUBSTITUTE FROM SEAWEED.

"Seagumite":

Considerable attention has been aroused during the past few weeks (says *Chambers's Journal* for May) by the appearance of a substitute for india-rubber, vulcanite and leather, under the name of seagumite. It is the discovery of a London chemist, and the fundamental material from which it is made is seaweed. Seeing that this article is so abundant around our coasts, the possibility of being able to turn it to valuable commercial account not only opens up a new industry, but at the same time finds an economic market for what at present is virtually useless. The method of manufacture is a secret; but, judging from the results of the trials to which the new substance has been submitted under arduous everyday conditions, it appears to have a great future in many ramifications of commerce. Seagumite is not only damp-proof, non-inflammable, and germ-proof, but is not affected by heat, cold oils, or exposure to weather. It can be made as tough as desired, and consequently is an

EXCELLENT SUBSTITUTE FOR VULCANITE.

To the electrical trade this is of far-reaching importance, as it brings into vogue a new and cheaper medium said to possess all the insulating properties of india-rubber, from which vulcanite is prepared.

A series of tests were carried out with this composition at the Westminster testing laboratories, and it was found capable of withstanding a test of thirty-two thousand volts. As a packing material in steam-engines it has proved highly serviceable, and stands the work excellently; while the fact that it withstands the action of chemicals and acids extends its sphere of usefulness still more. It can be used for the manufacture of motor-tires just as easily; it is as resilient as rubber, and costs about 30 per cent. less than the rubber tire. Boots and shoes can be made from it; and not only is the footgear lasting and hygienic, but its damp-resisting quality is its most attractive feature. Compared with leather, boots can be made of seagumite for about half the price. Wherever leather or vulcanite is used, seagumite is equally applicable, and for the most part with far better results. It is practically unbreakable, is almost imperishable, and completely fireproof, the blast of a gas blow-pipe only slightly charring the surface.

A factory is being erected for the manufacture of this substitute, with an output of six tons per week at first; but should the anticipations of those concerned in the exploitation of this discovery be fulfilled, and the material prove equal to the article which it is devised to displace, the output will have to be increased very considerably, as a heavy demand is certain to ensue. Indeed, already the various industries to which the substance makes appeal are displaying practical interest in the development.

ARTIFICIAL RUBBER FROM SEA FISH.

Our Brussels Correspondent states that it is announced that progress is now being made with the erection at Ymuiden, in Holland, of works for the manufacture of artificial rubber according to the process of a M. Van der Heyden. The raw material is principally sea fish, to which 15 to 16 per cent. of natural rubber is added, and afterwards treated by secret process. The product obtained is said to be as flexible and elastic as natural rubber, capable of being vulcanised rapidly, and insensible to the action of benzine and heat. The by-products may serve for the manufacture of artificial manure, and the cost of production is said to be very low. —London *Times*, May 30.

SUMATRA TEA PROSPECTS.

When in Sumatra last year I wrote at some length on the possibilities of tea cultivation in conjunction with rubber in that island, and ventured the opinion that the experiments then in operation would give rise to extensions on a more ambitious scale. The shrubs I saw had made exceptionally strong and healthy growth, and expert opinion upon the manufactured leaf was to the effect that the tea was of similar value to average lowcountry Ceylon. It is now reported that one estate in the East Coast district is extending an experimental 500 acres to one of 1,500 acres, while several plantations at a greater elevation are pushing rapidly ahead with the new cultivation. With the enormous growth in the demand for which Australia will be responsible in future years, there appears to be a great future for tea in the Netherlands Indies. Java has already established itself as a producer, hence the progress of tea-planting in Sumatra will be watched with much interest. —E. L. Killick.—*Financier*, June 18.

His Excellency Sir Henry Edward McCallum, G.C.M.G., Governor of Ceylon,
President of the Ceylon Agricultural Society.